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Pesticide Fact Sheet Number 226: Bensulfuron Methyl

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16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, science findings.

b. Identifiers/Open-Ended Terms

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Pesticide Fact Sheet

Name of Chemical: Bensulfuron Methyl
Reason for Issuance: Registration (New Chemical)
Date Issued: 2/17/89
Fact Sheet Number: 226

1. Description of Chemical

Generic Name: Methyl 2-[[[[[(4,6-dimethoxy pyrimidin-2-yl)amino]-carbonyl]-amino]sulfonyl]methyl]benzoate
Common Name: Bensulfuron Methyl
Trade Name: Londax®
EPA Shaughnessy Code: 128880
Chemical Abstracts Service (CAS) Number: 83055-99-6
Year of Initial Registration: 1989
Pesticide Type: Herbicide
Chemical Family: Sulfonyl-Urea
U.S. Producer: E.I. du Pont de Nemours & Company, Inc.

2. Use Patterns and Formulations

Application Site: Aquatic food crops (selective preemergence and early postemergence control of certain broadleaf weeds and sedge weeds in continuously flooded rice).

Type of Formulation: Bensulfuron methyl ester is currently being proposed for registration as a 60% Dry Flowable.

Amount and Method of Application: Maximum application of 1.67 ounces of Londax® herbicide/A/season. Applied directly to standing water, and water held static on the field for a minimum of 5 days. At time of application, the water level should be high enough so that the soil is completely covered with water (at least 3 inches).

Carrier: Water

3. Science Findings

Summary Science Statement: Bensulfuron methyl ester is a herbicide with low toxicity. The Toxicity Categories were III for acute dermal, and IV for the acute oral, acute inhalation, eye irritation, and dermal irritation. It was not a dermal sensitizer.

In a rabbit teratology study, the high-dose does had higher than expected instances of resorption, abortion, and maternal death (possibly iatrogenic). There was no evidence of terata in either the rat or rabbit.

Although the maximum doses used in the rat and mouse subchronic and chronic studies were substantial, MTD doses were not reached. There was no evidence of oncogenicity in these studies, or in studies of structurally related analogs. The major target organ was the liver. The liver effects observed in many studies may have been either a mild toxic effect, or a normal physiological (i.e., detoxification) response to a xenotoxin.

The mutagenicity battery was essentially negative, although there was a slight increase in sister chromatid exchange frequency in the nonactivated system at the maximum concentration. A corresponding effect was not seen in the activated system.

The metabolism study demonstrated that bensulfuron methyl ester is readily absorbed from the intestine and eliminated in the urine and feces. There were no metabolites found in respired air, and only minute quantities were found distributed in the body tissues. Nearly all of the absorbed dose was eliminated within 96 hours.

The data considered in support of the registration include:

- Plant and animal metabolism studies.

- An acute oral rat study with an LD_{50} greater than (>) 5000 milligrams (mg)/kilogram (kg) (limit test).

- A 90-day dog feeding study with a no-observed-effect level (NOEL) of 1000 ppm (32.1 and 36.3 mg/kg/day male/female (M/F)).

- A 90-day mouse feeding study with a NOEL of 1000 ppm (132 and 133 mg/kg/day, M/F).

- A 90-day rat feeding study with a NOEL of 1500 ppm (93 and 111 mg/kg/day, M/F).

- A rat teratology study with a developmental NOEL of 1320 mg/kg/day, the highest dose tested (HDT).

- A rabbit teratology study with a developmental NOEL of 300 mg/kg/day.

- A two-generation rat reproduction study with a reproductive NOEL of 7500 ppm (309 and 405 mg/kg/day, M/F) (HDT).

- A Salmonella/Mammalian Activation Assay, negative with and without metabolic activation.

- An *in vivo* bone marrow chromosome study in rats with no evidence of induced chromosome aberration in bone marrow.

- An *in vitro* sister chromatid exchange assay in CHO cells with a slight increase in SCE frequency in nonactivated system at maximum concentration, but negative in the activated system at the same concentration.

- A 1-year dog feeding study with a NOEL of 750 ppm (21.4 and 19.9 mg/kg/day, M/F).

- A 2-year mouse chronic feeding/oncogenicity study with a NOEL of 2500 ppm (226 and 227 mg/kg/day, M/F) with no oncogenic potential observed under conditions of the study up to 5000 ppm (455 and 460 mg/kg/day, M/F) (HDT).

- A 2-year rat chronic feeding/oncogenicity study with a NOEL of 750 ppm (30 and 40 mg/kg/day, M/F) with no oncogenic potential observed under conditions of the study up to 7500 ppm (309 and 405 mg/kg/day, M/F) (HDT).

Based on a NOEL of 19.9 mg/kg/day in the 1-year dog feeding study and a hundredfold safety factor, the acceptable daily intake (ADI) has been set at 0.2 mg/kg/day.

There are no regulatory actions pending against the registration of bensulfuron methyl ester.

The nature of bensulfuron methyl ester in rice plants is adequately understood.

Based on column leaching studies, bensulfuron methyl ester was found to have the potential to leach in soils of low organic material content such as the Norfolk sandy loam and intermediate mobility on the Norfolk loamy soils.

Terrestrial Organisms

Londax® has been characterized as practically nontoxic to birds on subacute dietary and acute oral bases. On the basis of the data indicating low toxicity, in conjunction with very low use rates, the Agency concludes that the proposed use of Londax® is not expected to adversely affect nontarget terrestrial organisms.

Aquatic Organisms

Daphnia LC_{50} data indicate that Londax® is practically nontoxic to aquatic invertebrates on an acute basis. Acute hazard to freshwater aquatic invertebrates is not anticipated from the proposed use.

Two acute studies on freshwater fish were submitted; the studies showed Londax® to be practically nontoxic to bluegill and rainbow trout (LC_{50}'s > 150 ppm). Acute hazard to freshwater fish is not anticipated from the proposed use.

Tier II testing for aquatic plant species has not been satisfied. This study was flawed as excessively high initial cell populations were used. This aquatic phytotoxicity study is the only remaining gap in the ecological effects data base.

Endangered Species

The Agency has determined that no federally listed species will be exposed to Londax® from the proposed use on rice.

4. Chemical Characteristics:

Physical State: Solid
Color: White to pale yellow
Odor: None
Melting Point: 181 °C
Solubility: In water at 25 °C:

pH 4.8, 0.0029 mg/mL
pH 5.8, 0.012 mg/mL
pH 6.9, 0.120 mg/mL
pH 7.8, 1.02 mg/mL

In organic solvents at 20 °C:

Hexane	0.00031 mg/mL
Ethyl acetate	1.66 mg/mL
Methylene chloride	11.72 mg/mL
Xylene	0.28 mg/mL
Acetonitrile	5.38 mg/mL
Methanol	0.99 mg/mL
Acetone	1.38 mg/mL

pH: 6.4 to 6.9 (slurry in water).

5. Stability

The technical material decomposes on melting. In aqueous solutions the technical material is stable under slightly alkaline conditions, i.e., pH 8, while it will degrade slowly under acidic conditions.

In organic solvents such as CH_2Cl_2, EtOAc, acetone, or ACN at 25 ° C, the technical material is very stable. However, it can break down in MeOH and DMSO.

The half-life in an aqueous photolysis experiment is about 4 hours. This is independent of pH.

6. Biological Activity

Mechanism of Pesticidal Action: Londax® inhibits growth of susceptible weeds. Following preemergence or early postemergence applications (to weeds), leaves of susceptible plants will appear chlorotic in 3 to 5 days and necrosis of the growing point will subsequently occur. Susceptible plants are controlled in 7 to 21 days, depending on species, as evidenced by complete necrosis of the leaf tissue and growing point. In some cases, affected plants will be stunted and remain green, but are not competitive with the crop.

The herbicidal action of Londax® may be influenced by temperature. Expression of herbicide symptoms is accelerated at warmer temperatures and may be delayed when air or water temperatures are below 65 °F. Under cool conditions, the appearance of chlorosis and eventual necrosis in susceptible plants may be delayed beyond 5 days. Occasional temporary chlorosis and/or growth retardation of rice may occur following Londax® application. These symptoms are accentuated at high ambient temperatures and cold water temperatures. These symptoms are normally transient and disappear within 2 to 3 weeks after application.

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